Distribution function of random strains in an elastically anisotropic continuum and defect strengths of Tm³⁺ impurity ions in crystals with zircon structure

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Abstract
© 2017 American Physical Society. We construct a distribution function of the strain-tensor components induced by point defects in an elastically anisotropic continuum, which can be used to account quantitatively for many effects observed in different branches of condensed matter physics. Parameters of the derived six-dimensional generalized Lorentz distribution are expressed through the integrals computed over the array of strains. The distribution functions for the cubic diamond and elpasolite crystals and tetragonal crystals with the zircon and scheelite structures are presented. Our theoretical approach is supported by a successful modeling of specific line shapes of singlet-doublet transitions of the Tm³⁺ ions doped into ABO₄ (A=Y, Lu; B=P, V) crystals with zircon structure, observed in high-resolution optical spectra. The values of the defect strengths of impurity Tm³⁺ ions in the oxygen surroundings, obtained as a result of this modeling, can be used in future studies of random strains in different rare-earth oxides.

http://dx.doi.org/10.1103/PhysRevB.96.014116

References


